distributed across more than one fraction. One interpretation of such results is that the same enzyme occurs in multiple organelles. Claude, however, viewed the fraction in which it was in highest concentration as the likely true locus and the smaller amounts found in other fractions as contamination resulting from inexactness in the process of fractionation. de Duve construed this as a major insight on Claude's part and expressed it in the postulate "*a given enzyme belongs to a single intracellular component in the living cell*" (de Duve & Berthet, 1954, p. 239). To this de Duve himself added a second postulate: "all members of a given subcellular population have the same enzymatic composition," which he labeled the *postulate of biological homogeneity* (1963–4, p. 52).[13] Commenting on the value of these assumptions, de Duve wrote,

> granting these two postulates, especially that of biochemical homogeneity, we can now use the enzymes as markers for their host particles and conduct tissue fractionation experiments very much like any other type of chemical fractionation. We may, at least in the initial analytical phase of the work, forget all about morphological features and treat suspensions of ground cells or tissues as mixtures of different populations of physical entities to be identified, characterized, resolved, and purified, with as sole guides the enzymes. If we can reach the final preparative phase and achieve sufficient purification, then the test of our working hypotheses will come, for morphological examination will show whether our deductions were in fact valid or not. (1963–4, p. 53)

Not everyone accepted these postulates. They constitute major assumptions about how cells are organized, and many investigators found it suspicious to invoke them in the very interpretation of fractionation studies. Why should cells follow a design principle in which each chemical constituent is limited to a particular organelle?

Cell fractionation was not the only way to localize chemicals in cell structures. When selective stains became available, histochemists used uptake of the stain to determine the locus of substances in slices or even whole mounts of tissues. David Glick, a pioneer in developing quantitative histochemical methods, called for use of such methods to vindicate the results of fractionation studies: "it would be best to seek proof of the specific localization by an independent method, i.e., one not dependent on centrifugal separations" (1953, p. 451). Glick can here be seen to be requesting consilience with other techniques before accepting cell fractionation results. In the case of some

[13] Claude was characterized by de Duve and Beaufay as altering the question investigators were asking from "what is in . . . ?" to "where is . . . ?"